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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROLF SCHALLER and JASON W. BUELOW

Appeal 2008-4923
Application 10/622,165
Technology Center 1700

Decided:[1] March 12, 2009

Before EDWARD C. KIMLIN, BRADLEY R. GARRIS, and CHUNG K. PAK, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's decision finally rejecting claims 1 through 5, all of the claims pending in the above-identified application. We have jurisdiction under 35 U.S.C. § 6.

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

The subject matter on appeal is directed to "thermal management of pressurized fuel cell systems with compressor/expander systems" (Spec. 1, para. [0003]). Details of the appealed subject matter are recited in representative claim 1 reproduced below:

1. A fuel cell system comprising:

a fuel cell having a housing enclosing an anode chamber, a proton exchange membrane and a cathode chamber, the cathode chamber being separated from the anode chamber by the proton exchange membrane, the housing adapted to transfer waste heat of the fuel cell;

a cathode supply line coupled to a supply of compressed oxygen-containing gas and to the cathode chamber;

a fuel supply coupled to the anode chamber;

a cathode exhaust gas line;

a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell; and

an expansion turbine,

the cathode exhaust gas line fluidly connecting the cathode chamber and the expansion turbine, the heat exchanger being thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine, whereby the heat exchanger transfers heat energy from the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line.

As evidence of unpatentability of the claimed subject matter, the Examiner has proffered the following prior art references:

Cownden	US 6,316,134 B1	Nov. 13, 2001
Xu	US 6,551,732 B1	Apr. 22, 2003

The Examiner has finally rejected the claims on appeal as follows:

1) Claims 1 through 5 under 35 U.S.C. § 112, first paragraph, for failing to provide written descriptive support for the subject matter presently claimed in the application disclosure as originally filed[2];

2) Claims 1 through 4 under 35 U.S.C. § 102(e) as anticipated by the disclosure of Xu;

3) Claim 5 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Xu and Cownden; and

4) Claims 1 through 5 under 35 U.S.C. § 102(e) as anticipated by the disclosure of Cownden.

Appellants appeal from the Examiner's decision finally rejecting the claims on appeal.

ISSUES

With respect to the Examiner's § 112 rejection, the issue is: Has the Examiner demonstrated that the application disclosure as originally filed does not reasonably convey to the artisan that the inventors had possession

[2] Although the Examiner employs an unfortunate expression relating to enablement, it is clear from the Examiner's explanation and Appellants' response that the § 112 rejection in question is directed to the written description requirement for the claimed invention. (See Ans. 3 and 7-9 and App. Br. 3-4). The Examiner also objects to the claim limitation subjected to the § 112 rejection in question under 35 U.S.C. § 132. (See Ans. 3). When an amendment introduces new matter into claims, rather than to a Specification, a rejection, not an objection, is normally appropriate. *See Manual of Patent Examining Procedure (M.P.E.P.)* § 608.04 and 608.04(c), pp. 600-128 and 600-129 (Rev. 5, Aug. 2006). Nevertheless, our decision on the § 112 rejection in question will have the same effect on the new matter objection in this situation since the same limitation is involved. *See M,P.E.P.* § 608.04(c), pp. 600-129 (Rev. 5, Aug. 2006).

of the later added limitation "a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell" recited in claim 1?

With respect to the Examiner's §§ 102(e) and 103(a) rejections based on the disclosure of Xu, the issue is: Has the Examiner demonstrated that Xu teaches the limitation "a heat exchanger coupled to [the housing of] the fuel cell for receiving waste heat from the housing of the fuel cell" for the purpose of transferring the recovered waste heat from the housing to the particular location of a cathode exhaust stream line as recited in claim 1?

With respect to the Examiner's § 102(e) rejection based on the disclosure of Cownden, the issue is: Has the Examiner demonstrated that Cownden describes the claimed heat exchange structural arrangement capable of receiving waste heat from the housing of the fuel cell and transferring the waste heat therefrom to the particular location of the cathode exhaust line as recited in claim 1 with sufficient specificity to constitute anticipation within the purview of 35 U.S.C. § 102?

FINDINGS OF FACT

The Factual Findings set forth below are supported by a preponderance of the evidence:

35 U.S.C. § 112

1. Claim 1, as originally filed, recites "the housing [of a fuel cell] adapted to transfer waste heat of the fuel cell...."

2. The Specification, as originally filed, describes (p. 2, para. [008]) that:

> The fuel cell system also includes a cathode exhaust gas line, a heat exchanger coupled to the fuel cell for receiving waste heat of the fuel cell, and an expansion turbine. The cathode exhaust gas line fluidly connects the cathode chamber and the expansion turbine. The heat exchanger is thermally coupled to

> the cathode exhaust gas line between the cathode chamber and the expansion turbine, so that the heat exchanger can transfer energy from the waste heat of the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line.

3. The Specification, as originally filed, also describes (p.4, para. [0017] and [0018]) that:

> [0017] With reference now to Figure 2, the cathode exhaust line 24 passes through an additional heat exchanger 100. Waste heat 110 of the fuel cell 10 is collected and passed to heat exchanger 100. Additional waste heat 120 from other system components and sources found in fuel cell power systems, such as combustors, compressed gas, or fuel processors or reformers, can also be combined with the waste heat 110 from the fuel cell 10.
>
> [0018] The waste heat 110, 120 can be transferred by any one of a plethora of heat transfer methods. This can include direct conduction, such as incorporating the cathode exhaust line 24 into an outer housing of the fuel cell 10 or other component, natural convection of heated air or other fluids from the heat source to a radiator-type structure incorporating the cathode exhaust gas line 24, or a system incorporating pumping of a heat transfer medium to a heat exchanger thermally coupled to the cathode exhaust gas line 24.

35 U.S.C. §§ 102(e) and 103(a)

4. Xu teaches a fuel cell power system comprising a fuel cell (3) having an anode side (22) and a cathode side (20) separated by a proton exchange membrane (col. 5, ll. 28-39 and col. 6, ll. 12-16, together with Fig. 1).

5. Xu teaches a compressed air stream line connecting the cathode side (20) and an air compressor (10) to deliver a compress air stream (102) to the cathode side (20) and a fuel supply stream line connected to the anode side

(22) to deliver a fuel stream (306) to the anode side (22) (col. 5, ll. 28-39 and col. 6, ll. 8-16, together with Fig. 1). .

6. Xu teaches a cathode exhaust stream line delivering one part of a cathode exhaust stream (104) to an expander (11) corresponding to the claimed expansion turbine via a combustor (1) and another part to the cathode exhaust stream to an expander (11) via heat exchangers (4 and 5), a thermal reformer (6), the anode side (22) and the combustor (12) (col. 5, l. 28 to col. 6, l. 34 and Fig. 1).

7. Cownden teaches a hydrocarbon fuel solid polymer fuel cell system comprising a fuel cell stack 200, a supply line directing a compressed oxygen-containing gas 19 from compressors (246 and 250) to the cathode of the fuel cell stack 200, a supply line directing a hydrogen-rich fuel stream 13 to the anodes of the fuel cell stack 200; and an exhaust line for conveying a cathode exhaust stream 20 from the cathodes of the fuel cell stack 200 to a condenser 254, a water separator 256, a furnace burner 218, and then a turbine 208 of the turbocompressor (col. 16, l. 35 to col. 18, l. 36 and Fig. 2).

8. Cownden also teaches (col. 17, ll. 55-63) that:

> Between the cathode outlet of fuel cell stack 200 and furnace burner 218 the cathode exhaust stream is advantageously employed as a heat transfer fluid to assist with the thermal management within the fuel cell electric power generation system. The cathode exhaust fluid acts as a coolant fluid in several components, while the cathode exhaust is itself advantageously heated prior to being introduced to furnace burner 218.

9. Cownden teaches that the typical operating temperature of the fuel cell stack 200 is close to the temperature of pressurized oxidant stream 17 (i.e., a temperature varying from 100 to 250° F) (col. 17, ll. 21-32).

PRINCIPLES OF LAW

The written description requirement found in the first paragraph of 35 U.S.C. § 112 is separate from the enablement requirement of that provision. *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563 (Fed. Cir. 1991) ("35 U.S.C. § 112, first paragraph, requires a 'written description of the invention' which is separate and distinct from the enablement requirement.") As our reviewing court stated in *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983):

> The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language....The content of the drawings may also be considered in determining compliance with the written description requirement. [Citations omitted.]

The above test requires that the original disclosure as a whole must be considered. *In re Wright*, 866 F.2d 422, 425 (Fed. Cir. 1989). Original claims are part of the original disclosure. *In re Gardner*, 475 F.2d 1389, 1391 (CCPA 1973); *In re Benno*, 768 F.2d 1340, 1346 (Fed. Cir. 1985).

Under 35 U.S.C. § 102(b), anticipation is established only if "each and every element as set forth in the claim is found, either expressly or inherently, described in a single prior art reference." *Verdegaall Bros. v.*

Union Oil Co. of California, 814 F.2d 628, 631 (Fed. Cir. 1987). The prior art reference must identify each and every element as set forth in the claim "with sufficient specificity to constitute a description thereof within the purview of 35 U.S.C. § 102[(e)]". *In re Schaumann*, 572 F.2d 312, 315 (CCPA 1978). As stated in *In re Arkley*, 455 F.2d 586, 587-88 (CCPA 1972) states:

> [F]or the instant rejection under 35 U.S.C. § 102(e) to have been proper, the [prior art] reference must clearly and unequivocally disclose the claimed compound or direct those skilled in the art to the compound without any need for picking, choosing, and combining various disclosures.... Such picking and choosing may be entirely proper in the making of a 103, obviousness rejection, where the applicant must be afforded an opportunity to rebut with objective evidence any inference of obviousness..., but it has no place in the making of a 102, anticipation rejection.

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations, if necessary. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). According to *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1740-41 (2007):

> [A]nalysis [of whether the subject matter of a claim would have been obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ....

S*ee also DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1361 (Fed. Cir. 2006) ("The motivation need not be found in the references sought to be combined, but may be found in any

number of sources, including common knowledge, the prior art as a whole, or the nature of the problem itself."); *In re Bozek*, 416 F.2d 1385, 1390 (CCPA 1969) ("Having established that this knowledge was in the art, the examiner could then properly rely, as put forth by the solicitor, on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.'"); *In re Hoeschele*, 406 F.2d 1403, 1406-407 (CCPA 1969) ("[I]t is proper to take into account not only specific teachings of the references but also the inferences which one skilled in the art would reasonably be expected to draw therefrom . . . ."). Nevertheless, "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR* at 1741-42, *quoting In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

ANALYSES AND CONCLUSIONS OF LAW

35 U.S.C. § 112, First Paragraph

The Specification as originally filed states that a heat exchanger coupled to the fuel cell for receiving waste heat of the fuel cell "is thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine, so that the heat exchanger can transfer energy from the waste heat of the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line." The Specification and original claim 1 also state that the waste heat of the fuel cell can be recovered from an outer housing of the fuel cell and is transferred to the cathode exhaust line. It follows that the

original disclosure as a whole reasonably conveys to one of ordinary skill in the art that the heat exchanger for receiving waste heat of the fuel cell is coupled to the outer housing of the fuel cell to recover and transfer the waste heat from the housing of the fuel cell to the cathode exhaust gas line between the cathode chamber and the expansion turbine. Accordingly, we determine that the Examiner has not demonstrated that the original application disclosure as a whole does not reasonably convey to the artisan that the inventors had possession of the later added limitation "a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell" in claim 1 within the meaning of the first paragraph of 35 U.S.C. § 112.

35 U.S.C. §§ 102 and 103 based on the disclosure of Xu

The limitations "a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell" and "the housing adapted to transfer waste heat of the fuel cell"[3] recited in claim 1 require that the heat exchanger be coupled to the housing of the fuel cell in such a manner as to recover waste heat from the housing of the fuel cell. This recovered waste heat, according to the subsequent clause recited in claim 1, is transferred to the specific location of the cathode exhaust line. This interpretation is consistent with pages 2 and 4 of the Specification.

The Examiner's §§ 102 and 103 rejections are based on a finding that Xu teaches such features. However, a close reading of Xu does not reveal

[3] This limitation does not recite an intended use as asserted by the Examiner. It functionally defines a structural arrangement. The heat exchanger must be coupled to a fuel cell in such a manner that it must be capable of recovering waste heat from the outer housing of the fuel cell.

such features. It follows that the Examiner has not demonstrated that Xu teaches the limitation "a heat exchanger coupled to [the housing of] the fuel cell for receiving waste heat from the housing of the fuel cell" for the purpose of transferring the recovered waste heat to the specific location of the cathode exhaust line as recited in claim 1. Accordingly, we reverse the Examiner's § 102 rejection of claims 1 through 4 based on the disclosure of Xu and the Examiner's § 103 rejection of claim 5 based on the combined disclosures of Xu and Cownden.

35 U.S.C. § 102 based on the disclosure of Cownden

Cownden teaches a hydrocarbon fuel solid polymer fuel cell system comprising a fuel cell stack 200, a supply line directing a compressed oxygen-containing gas 19 from compressors (246 and 250) to the cathode of the fuel cell stack 200, a supply line directing a hydrogen-rich fuel stream 13 to the anodes of the fuel cell stack 200, and an exhaust line for conveying a cathode exhaust stream 20 from the cathodes of the fuel cell stack 200 to a condenser 254, a water separator 256, a furnace burner 218, and then a turbine 208 of the turbocompressor. Cownden, like Appellants, also teaches that:

> Between the cathode outlet of fuel cell stack 200 and furnace burner 218 the cathode exhaust stream is advantageously employed as a heat transfer fluid to assist with the thermal management within the fuel cell electric power generation system. The cathode exhaust fluid acts as a coolant fluid in several components, while the cathode exhaust is itself advantageously heated prior to being introduced to furnace burner 218.

Although Cownden implies that the housing of the fuel cell is heated, it does not specifically teach that the waste heat from the housing of the fuel cell or fuel cell stack is recovered to heat the cathode exhaust fluid. Thus, it may very well have been obvious to employ a heat exchange structural arrangement to recover the waste heat from the housing of the fuel cell to heat the cathode exhaust fluid for the purpose of assisting "the thermal management within the fuel cell electric power generation system" prior to introducing the fluid to the furnace burner and then to the expander turbine. However, the Examiner has not demonstrated that Cownden describes the claimed heat exchange structural arrangement capable of receiving waste heat from the housing of the fuel cell and transferring the waste heat therefrom to the particular location of the cathode exhaust line with "sufficient specificity" to constitute anticipation within the purview of 35 U.S.C. § 102(e). *Schaumann*, 572 F.2d at 315. As pointed out by *Arkley*, 455 F.2d at 589:

> We are simply reversing a rejection on the ground that the claim on appeal is anticipated under § 102… It may well be unpatentable because of obvious under § 103…but no such rejection is before us….

ORDER

In view of the foregoing, the decision of the Examiner is reversed.

REVERSED

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